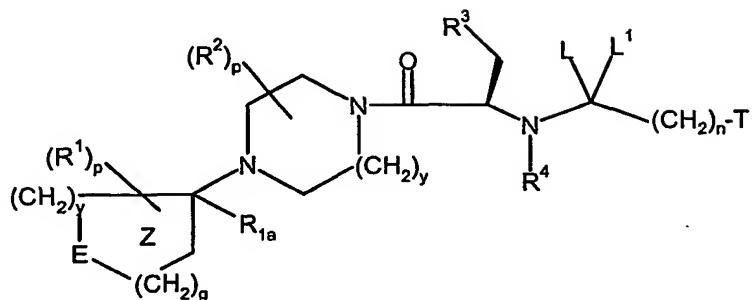


WHAT WE CLAIMS IS:

1. A compound of formula I:



5

or a pharmaceutically acceptable salt, solvate or stereoisomer thereof,
wherein:

L and L¹ are both hydrogen or combine together to form an oxo group;

10

E is: O, S, NR^{1b}, SO, SO₂, CR⁹, or C(R⁹)₂, provided that when E is CR⁹, or C(R⁹)₂, R⁹ may combine with an adjacent R¹ to form a 5, 6, or 7-member saturated or unsaturated carbocycle;

wherein the Z ring has 0, or 1 double bond;

15

R¹ is selected from the group consisting of:

hydrogen,

C₁-C₈ alkyl,

C₂-C₈ alkenyl,

20 C₂-C₄ haloalkyl

(D)C₃-C₇ cycloalkyl,

(D)phenyl,

aryl,

C(O)OC₁-C₈ alkyl,

25 wherein phenyl, aryl, alkenyl, and cycloalkyl groups are optionally substituted with hydroxy, halo, C₁-C₈ alkyl, C₁-C₄ alkoxy, C₂-C₄ haloalkyl, and (D)C₃-C₇

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cycloalkyl provided that the halo, hydroxy are not substituted on a carbon atom adjacent to a heteroatom;

R_{1a} is: hydrogen,

5 C₁-C₈ alkyl,

(D)C₃-C₇ cycloalkyl,

(D)phenyl,

(D)aryl,

(D)heteroaryl;

10 (D)C(O)C₁-C₄ alkyl,

(D)C(O)OC₁-C₄ alkyl,

(CH₂)_mN(R⁸)₂,

(CH₂)_mNR⁸C(O)C₁-C₄ alkyl,

(CH₂)_mNR⁸SO₂(C₁-C₄ alkyl),

15 (CH₂)_mOR⁸,

(CH₂)_mSC₁-C₄ alkyl,

(CH₂)_mSO(C₁-C₄ alkyl),

(CH₂)_mSO₂(C₁-C₄ alkyl), or

(CH₂)_mSO₂ N(R⁸)₂;

20 wherein C₁-C₈ alkyl, C₃-C₇ cycloalkyl, phenyl, aryl and heteroaryl are optionally substituted with one to five substituents independently selected from the group consisting of perfluoroC₁-C₄ alkoxy, halo, hydroxy, C₁-C₈ alkyl, C₁-C₄ alkoxy, and C₁-C₄ haloalkyl; provided that halo and hydroxy groups are not substituted on a carbon atom adjacent to a heteroatom;

25

R^{1b} is: hydrogen,

C₁-C₈ alkyl,

(D)C₃-C₇ cycloalkyl,

SO₂(C₁-C₈ alkyl),

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(D)C(O)C₁-C₄ alkyl,

(D)C(O)OC₁-C₄ alkyl,

(D)CON(R⁸)₂, or

SO₂(D)phenyl, wherein the phenyl group is optionally substituted with one to five
5 substituent selected from halo, and C₁-C₈ alkyl;

R² is: hydrogen,

C₁-C₈ alkyl,

CONHC₁-C₄ alkyl,

10 (D)phenyl, oxo, or

(D)C₃-C₇ cycloalkyl, provided that when R² is oxo, R² is on one of the ring
carbon atoms adjacent to the nitrogen atom bearing the Z ring;

R³ is: phenyl, aryl or thienyl;

15 wherein phenyl, aryl and thienyl are optionally substituted with one to three
substituents independently selected from the group consisting of:
cyano, perfluoroC₁-C₄ alkoxy, halo, C₁-C₈ alkyl, (D)C₃-C₇ cycloalkyl, C₁-C₄
alkoxy, C₁-C₄ haloalkyl;

20 R⁴ is: hydrogen,

C₁-C₈ alkyl,

CH₂(CH₂)_mC₁-C₄ alkoxy,

C(O)C₁-C₄ alkyl or

C(O)OC₁-C₄ alkyl;

25

R is: hydroxy,

halo,

C₁-C₈ alkyl,

C₂-C₈ alkenyl,

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C₁-C₈ alkoxy,
C₁-C₄ haloalkyl,
(D)C₃-C₇ cycloalkyl,
(D)aryl,
5 (D)heteroaryl;
(D)C(O)C₁-C₄ alkyl,
(D)C(O)OC₁-C₄ alkyl,
(D)C(O)heteroaryl,
(D)N(R⁸)₂,

10 (D)NR⁸C(O)C₁-C₄ alkyl,
(D)NR⁸SO₂(C₁-C₄ alkyl),
(D)OC₁-C₄ alkyl,
(D)OC(O)C₁-C₄ alkyl,
(D)heterocyclic,
15 (D)SC₁-C₄ alkyl, or
(D)SO₂N(R⁸)₂;

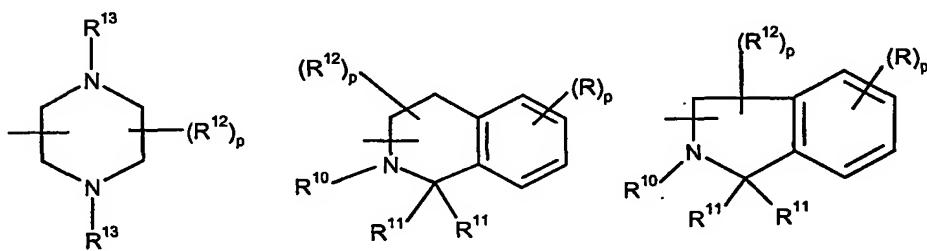
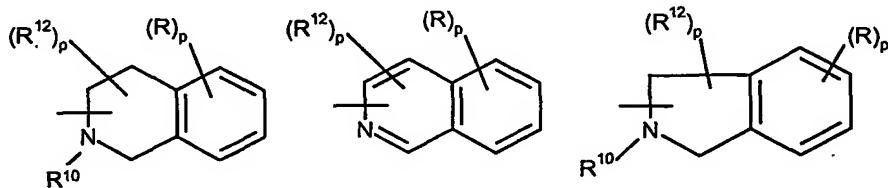
wherein C₁-C₈ alkyl, C₁-C₈ alkoxy, C₃-C₇ cycloalkyl, phenyl, aryl, heterocyclic,
and heteroaryl are optionally substituted with one to five substituents
independently selected from R⁸; and provided that when R is halo or hydroxy it is
not substituted on a carbon adjacent to a heteroatom;

20 each R⁸ is independently:
hydrogen,
oxo,
25 C₁-C₈ alkyl,
(D)C₃-C₇ cycloalkyl,
phenyl,
aryl or
heteroaryl,

wherein C₁-C₈ alkyl, C₃-C₇ cycloalkyl, phenyl, aryl and heteroaryl are optionally substituted with one to three substituents selected from the group consisting of C₁-C₈ alkyl, halo, and hydroxy; provided that the halo and hydroxy groups are not substituted on a carbon adjacent to a heteroatom;

5

T is:



R⁹ is independently:

hydrogen,

10 (C₁-C₈) alkyl,

C₂-C₈ alkenyl,

C(O)C₁-C₈ alkyl,

C₂-C₈ alkynyl,

phenyl,

15 aryl, or

heteroaryl;

R¹⁰ is: hydrogen,

(C₁-C₈) alkyl,

20 C₃-C₈ alkenyl,

C(O)C₁-C₈ alkyl,

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C₂-C₈ alkynyl,
phenyl,
aryl, or
heteroaryl;

5

R¹¹ is independently:

hydrogen, (C₁-C₈) alkyl, (D)phenyl, or aryl;

R¹² is independently:

10 C₁-C₈ alkyl,
 phenyl,
 aryl,
 heteroaryl,
 (CH₂)_nN(R⁸)₂,
15 (CH₂)_nNR⁸C(O)C₁-C₄ alkyl,
 (CH₂)_nNR⁸C(O)OC₁-C₄ alkyl,
 (CH₂)_n(OCH₂CH₂)_qN(R⁸)₂,
 (CH₂)_n(OCH₂CH₂)_qNR⁸C(O)C₁-C₄ alkyl,
 (CH₂)_n(OCH₂CH₂)_qNR⁸SO₂(C₁-C₄ alkyl), or
20 (CH₂)_n[O]_q(C₁-C₈)alkylheterocyclic; and wherein for R¹², n is 2-8 when R¹² is substituted on a carbon atom adjacent to a heteroatom;

R¹³ is independently:

25 hydrogen,
 C₁-C₈ alkyl,
 (D)C₃-C₇ cycloalkyl,
 (D)phenyl,
 C(O)C₁-C₈ alkyl,
 SO₂C₁-C₈ alkyl, or

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SO₂-phenyl;

D is: a bond or C₁-C₄ alkyl;

g is: 0, 1, or 2;

5 y is: 1 or 2;

m is: 1-4;

n is: 0-8;

p is: 0-4; and

q is: 0-1.

10 2. The compound according to Claim 1 wherein for the Z ring y is 1, or 2.

3. The compound according to Claim 1 wherein the Z ring is saturated.

4. The compound according to Claim 1 wherein the Z ring is cyclopentyl or cyclohexyl.

5. The compound according to Claim 3 wherein E is O, S, NR^{1b}, SO₂, SO, or

15 CHR⁹.

6. The compound according to Claim 1 wherein E is CH₂.

7. The compound according to Claim 1 wherein E is CHR⁹ and R⁹ combines with adjacent R¹ to form a benzene ring.

8. The compound according to Claim 1 wherein for the Z ring R¹ is

20 hydrogen, C₁-C₈ alkyl, C₁-C₈ alkenyl, C₂-C₄ haloalkyl, (D)C₃-C₇ cycloalkyl, 2-

fluorobenzyl, (D)phenyl, (CH₂)_mC(O)C₁-C₄ alkyl, (CH₂)_mN(R⁸)₂, or

(CH₂)_mNR⁸C(O)C₁-C₄ alkyl; D is a bond or CH₂; and p is 1; and m is 1.

9. The compound according to Claim 1 wherein R is hydrogen, methyl, trifluoromethyl, phenyl or benzyl, wherein phenyl and benzyl groups are optionally substituted with halo or hydroxy and p is 1.

25 10. The compound according to Claim 1 wherein R^{1a} is C₁-C₈ alkyl, C₁-C₈ alkenyl, C₂-C₄ haloalkyl, (D)C₃-C₇ cycloalkyl, (D)phenyl, (D)COR⁸, (D)N(R⁸)₂, or (D)NR⁸COR⁸.

11. The compound according to Claim 1 wherein R^{1a} is isopropyl, isobutyl, cyclohexylmethyl, phenyl, 2-fluorobenzyl or benzyl.

12. The compound according to Claim 11 wherein E is selected from the group consisting of: -NCH₃, -NCH(CH₃)₂, S, CR⁹, C(R⁹)₂, -NC(O)CH₃, -

5 NC(O)CH(CH₃)₂, -NCH₂CH₃, NSO₂CH₃, and O.

13. The compound according to Claim 12 wherein E is CR⁹ or C(R⁹)₂, wherein each R⁹ is independently selected from hydrogen and C₁-C₄ alkyl, and wherein each R⁹ may combine with an adjacent R¹ to form a 5 or 6-member carbocycle.

14. The compound according to Claim 1 wherein R² is hydrogen, C₁-C₈ alkyl,
10 C₁-C₄ haloalkyl, (D)C₃-C₇ cycloalkyl, (D)phenyl, or (D)C(O)C₁-C₈ alkyl.

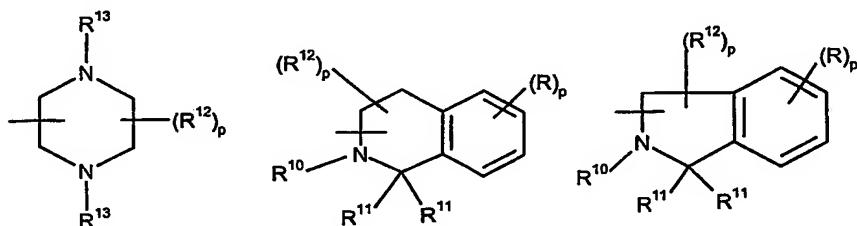
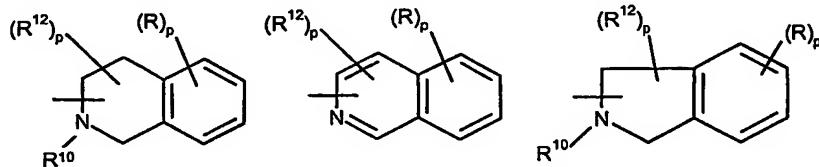
15. The compound of Claim 1 wherein R³ is phenyl optionally being para-substituted with chloro, bromo, benzyloxy, methoxy or methyl.

16. The compound of any one of Claims 1 to 15 wherein R³ is phenyl para-substituted with chloro.

15 17. The compound of any one of Claims 1 to 15 wherein R¹⁰ is hydrogen, C₁-C₄ alkyl, or C(O)C₁-C₄ alkyl.

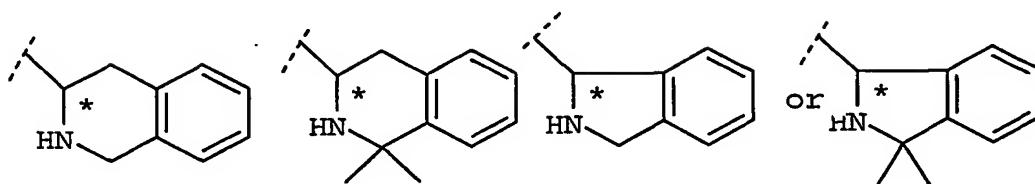
18. The compound of any one of Claims 1 to 15 wherein R¹⁰ is hydrogen at each occurrence.

19. The compound of any one of Claims 1-15 wherein T of the C domain is
20 selected from the group consisting of:

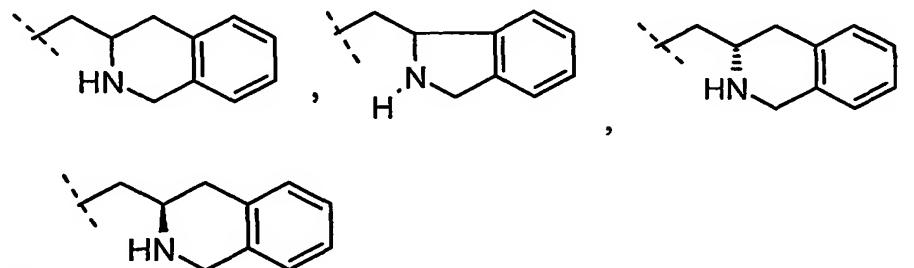


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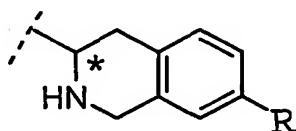
20. The compound according to Claims 1 to 15 wherein "T" is a moiety of the formula:



21. The compound according to any of Claims 1 to 15 wherein "T" is a moiety selected from the group consisting of:



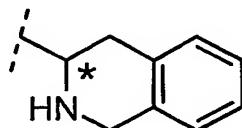
22. The compound of any one of Claims 1 to 15 wherein T is a moiety of the formula:



10

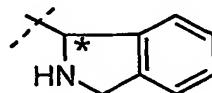
wherein R is as described; and wherein the carbon atom marked * represents a chiral center.

23. The compound of any one of Claims 1 to 15 wherein L and L¹ are each hydrogen; and T is a moiety of the formula:



15

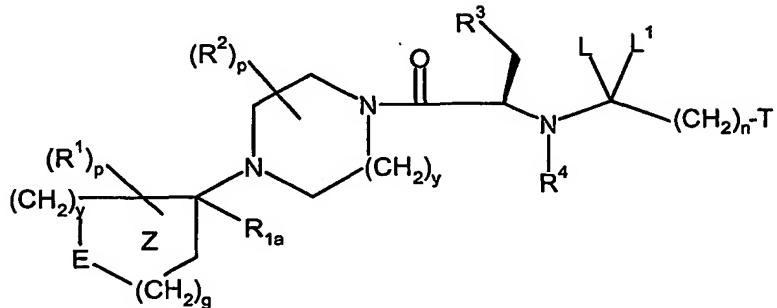
24. The compound according to any one of Claims 1 to 15 wherein L and L¹



are each hydrogen, and T is a moiety of the formula:

25. The compound of Claim 22, 23, or 24 wherein the carbon atom marked with * has the R or S configuration.

26. Use of a compound of formula I:



5

(I)

or a pharmaceutically acceptable salt, solvate or stereoisomer thereof,
wherein:

L and L¹ are both hydrogen or combine together to form an oxo group;

10 E is: O, S, NR^{1b}, SO, SO₂, CR⁹, or C(R⁹)₂, provided that when E is CR⁹, or C(R⁹)₂, R⁹ may combine with an adjacent R¹ to form a 5, 6, or 7-member saturated or unsaturated carbocycle;

wherein the Z ring has 0, or 1 double bond;

15 R¹ is selected from the group consisting of:

Hydrogen,

C₁-C₈ alkyl,

C₂-C₈ alkenyl,

C₂-C₄ haloalkyl

20 (D)C₃-C₇ cycloalkyl,

(D)phenyl,

aryl,

C(O)OC₁-C₈ alkyl,

wherein phenyl, aryl, alkenyl, and cycloalkyl groups are optionally substituted

25 with hydroxy, halo, C₁-C₈ alkyl, C₁-C₄ alkoxy, C₂-C₄ haloalkyl, and (D)C₃-C₇

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cycloalkyl provided that the halo, hydroxy are not substituted on a carbon atom adjacent to a heteroatom;

R_{1a} is: hydrogen,

5 C₁-C₈ alkyl,

(D)C₃-C₇ cycloalkyl,

(D)phenyl,

(D)aryl,

(D)heteroaryl;

10 (D)C(O)C₁-C₄ alkyl,

(D)C(O)OC₁-C₄ alkyl,

(CH₂)_mN(R⁸)₂,

(CH₂)_mNR⁸C(O)C₁-C₄ alkyl,

(CH₂)_mNR⁸SO₂(C₁-C₄ alkyl),

15 (CH₂)_mOR⁸,

(CH₂)_mSC₁-C₄ alkyl,

(CH₂)_mSO(C₁-C₄ alkyl),

(CH₂)_mSO₂(C₁-C₄ alkyl), or

(CH₂)_mSO₂ N(R⁸)₂;

20 wherein C₁-C₈ alkyl, C₃-C₇ cycloalkyl, phenyl, aryl and heteroaryl are optionally substituted with one to five substituents independently selected from the group consisting of perfluoroC₁-C₄ alkoxy, halo, hydroxy, C₁-C₈ alkyl, C₁-C₄ alkoxy, and C₁-C₄ haloalkyl; provided that halo and hydroxy groups are not substituted on a carbon atom adjacent to a heteroatom;

25

R^{1b} is: hydrogen,

C₁-C₈ alkyl,

(D)C₃-C₇ cycloalkyl,

SO₂(C₁-C₈ alkyl),

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(D)C(O)C₁-C₄ alkyl,

(D)C(O)OC₁-C₄ alkyl,

(D)CON(R⁸)₂, or

SO₂(D)phenyl, wherein the phenyl group is optionally substituted with one to five
5 substituents selected from halo, and C₁-C₈ alkyl;

R² is: hydrogen,

C₁-C₈ alkyl,

CONHC₁-C₄ alkyl,

10 (D)phenyl, oxo, or

(D)C₃-C₇ cycloalkyl, provided that when R² is oxo, R² is on one of the ring
carbon atoms adjacent to the nitrogen atom bearing the Z ring;

R³ is: phenyl, aryl or thienyl;

15 wherein phenyl, aryl and thienyl are optionally substituted with one to three
substituents independently selected from the group consisting of:
cyanato, perfluoroC₁-C₄ alkoxy, halo, C₁-C₈ alkyl, (D)C₃-C₇ cycloalkyl, C₁-C₄
alkoxy, C₁-C₄ haloalkyl;

20 R⁴ is: hydrogen,

C₁-C₈ alkyl,

CH₂(CH₂)_mC₁-C₄ alkoxy,

C(O)C₁-C₄ alkyl, or

C(O)OC₁-C₄ alkyl;

25

R is: hydroxy,

halo,

C₁-C₈ alkyl,

C₂-C₈ alkenyl,

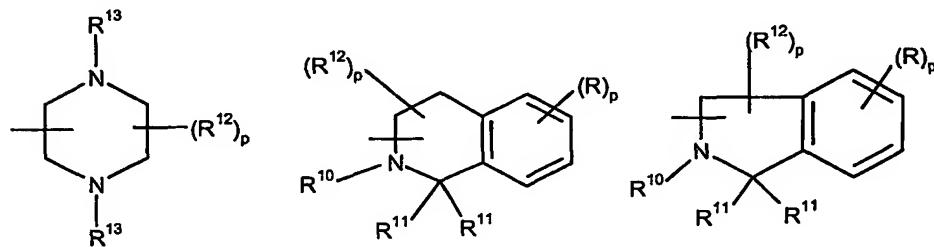
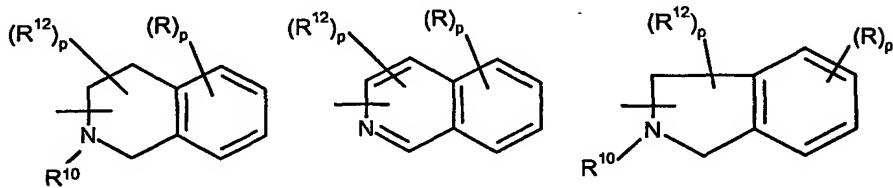
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- C₁-C₈ alkoxy,
C₁-C₄ haloalkyl,
(D)C₃-C₇ cycloalkyl,
(D)aryl,
5 (D)heteroaryl;
(D)C(O)C₁-C₄ alkyl,
(D)C(O)OC₁-C₄ alkyl,
(D)C(O)heteroaryl,
(D)N(R⁸)₂,
10 (D)NR⁸C(O)C₁-C₄ alkyl,
(D)NR⁸SO₂(C₁-C₄ alkyl),
(D)OC₁-C₄ alkyl,
(D)OC(O)C₁-C₄ alkyl,
(D)heterocyclic,
15 (D)SC₁-C₄ alkyl, or
(D)SO₂N(R⁸)₂;
wherein C₁-C₈ alkyl, C₁-C₈ alkoxy, C₃-C₇ cycloalkyl, phenyl, aryl, heterocyclic,
and heteroaryl are optionally substituted with one to five substituents
independently selected from R⁸; and provided that when R is halo or hydroxy it is
not substituted on a carbon adjacent to a heteroatom;
20 each R⁸ is independently:
hydrogen,
oxo,
25 C₁-C₈ alkyl,
(D)C₃-C₇ cycloalkyl,
phenyl,
aryl or
heteroaryl,

wherein C₁-C₈ alkyl, C₃-C₇ cycloalkyl, phenyl, aryl and heteroaryl are optionally substituted with one to three substituents selected from the group consisting of C₁-C₈ alkyl, halo, and hydroxy; provided that the halo and hydroxy groups are not substituted on a carbon adjacent to a heteroatom;

5

T is:



R⁹ is independently:

- 10 hydrogen,
 (C₁-C₈) alkyl,
 C₂-C₈ alkenyl,
 C(O)C₁-C₈ alkyl,
 C₂-C₈ alkynyl,

- 15 phenyl,
 aryl, or
 heteroaryl;

R¹⁰ is: hydrogen,

- 20 (C₁-C₈) alkyl,
 C₃-C₈ alkenyl,

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C(O)C₁-C₈ alkyl,

C₂-C₈ alkynyl,

phenyl,

aryl, or

5 heteroaryl;

R¹¹ is independently:

hydrogen, (C₁-C₈) alkyl, (D)phenyl, or aryl;

R¹² is independently:

10 C₁-C₈ alkyl,

phenyl,

aryl,

heteroaryl,

(CH₂)_nN(R⁸)₂,

15 (CH₂)_nNR⁸C(O)C₁-C₄ alkyl,

(CH₂)_nNR⁸C(O)OC₁-C₄ alkyl,

(CH₂)_n(OCH₂CH₂)_qN(R⁸)₂,

(CH₂)_n(OCH₂CH₂)_qNR⁸C(O)C₁-C₄ alkyl,

(CH₂)_n(OCH₂CH₂)_qNR⁸SO₂(C₁-C₄ alkyl), or

20 (CH₂)_n[O]_q(C₁-C₈)alkylheterocyclic; and wherein for R¹², n is 2-8 when R¹² is substituted on a carbon atom adjacent to a heteroatom;

R¹³ is independently:

hydrogen,

25 C₁-C₈ alkyl,

(D)C₃-C₇ cycloalkyl,

(D)phenyl,

C(O) C₁-C₈ alkyl,

SO₂C₁-C₈ alkyl, or

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SO₂-phenyl;

D is: a bond or C₁-C₄ alkyl;

g is: 0, 1, or 2;

y is: 1 or 2;

5 m is: 1-4;

n is: 0-8;

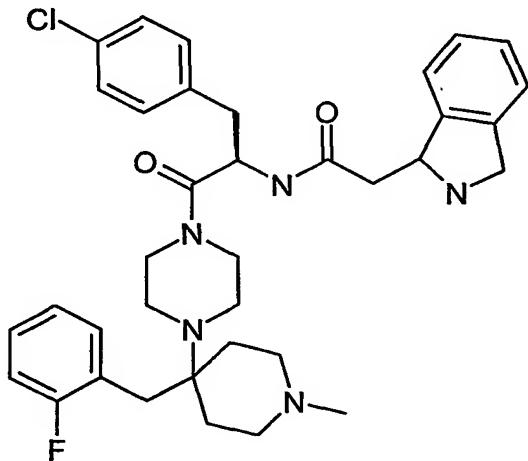
p is: 0-4; and

q is: 0-1, in the manufacture of a medicament for treating obesity and/or diabetes.

27. A pharmaceutical composition comprising a compound of any one of
10 Claims 1-25 and a pharmaceutical carrier.

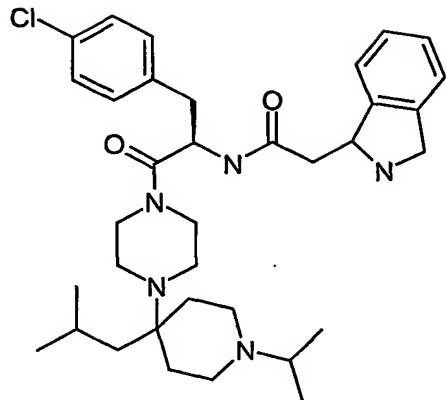
28. The pharmaceutical composition of Claim 27 further comprising a second active ingredient selected from the group consisting of an insulin sensitizer, insulin mimetic, sulfonylurea, alpha-glucosidase inhibitor, HMG-CoA reductase inhibitor, sequestrant cholesterol lowering agent, beta 3 adrenergic receptor agonist, neuropeptide Y antagonist, phosphodiester V inhibitor, and an alpha2 adrenergic receptor antagonist.

15 29. A compound selected from the group consisting of:

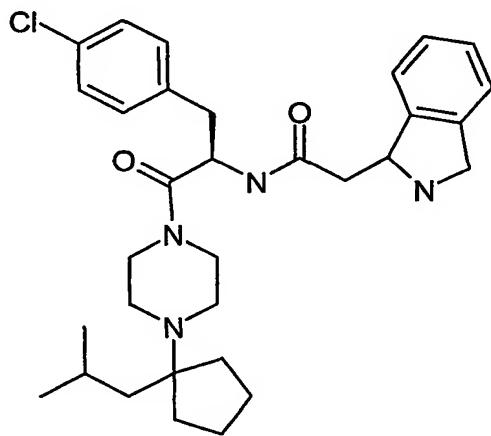


N-(1-(4-Chloro-benzyl)-2-{4-[4-(2-fluoro-benzyl)-1-methyl-piperidin-4-yl]-piperazin-1-yl}-2-oxo-ethyl)-2-(2,3-dihydro-1H-isoindol-1-yl)-acetamide,

-186-



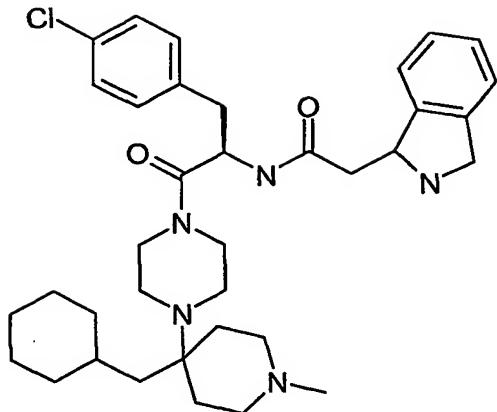
N-{1-(4-Chloro-benzyl)-2-[4-(4-isobutyl-1-isopropyl-piperidin-4-yl)-piperazin-1-yl]-2-oxo-ethyl}-2-(2,3-dihydro-1H-isoindol-1-yl)-acetamide,



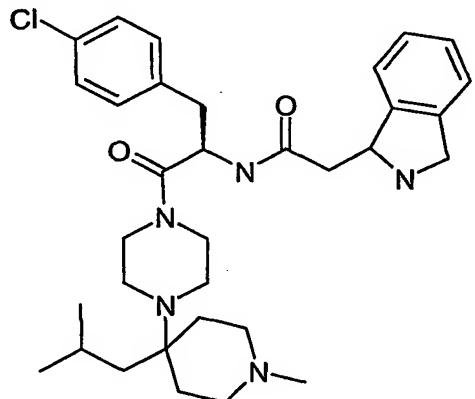
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N-{1-(4-Chloro-benzyl)-2-[4-(1-isobutyl-cyclopentyl)-piperazin-1-yl]-2-oxo-ethyl}-2-(2,3-dihydro-1H-isoindol-1-yl)-acetamide,

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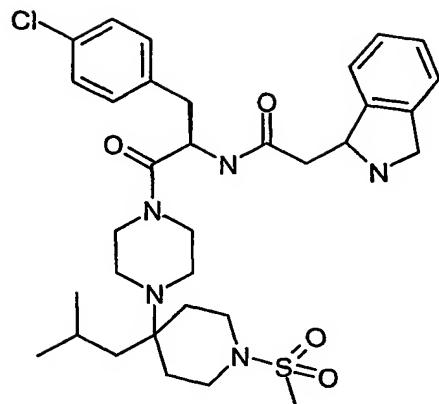
N-{1-(4-Chloro-benzyl)-2-[4-(4-cyclohexylmethyl-1-methyl-piperidin-4-yl)-piperazin-1-yl]-2-oxo-ethyl}-2-(2,3-dihydro-1H-isoindol-1-yl)-acetamide,



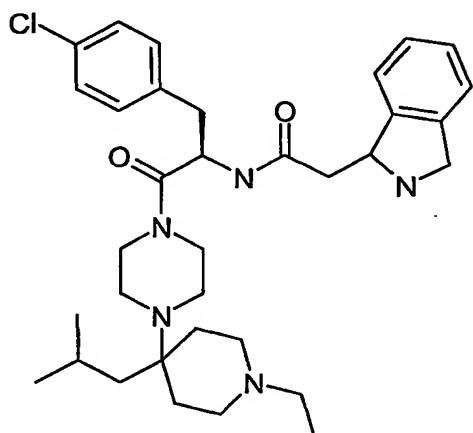
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N-{1-(4-Chloro-benzyl)-2-[4-(4-isobutyl-1-methyl-piperidin-4-yl)-piperazin-1-yl]-2-oxo-ethyl}-2-(2,3-dihydro-1H-isoindol-1-yl)-acetamide,

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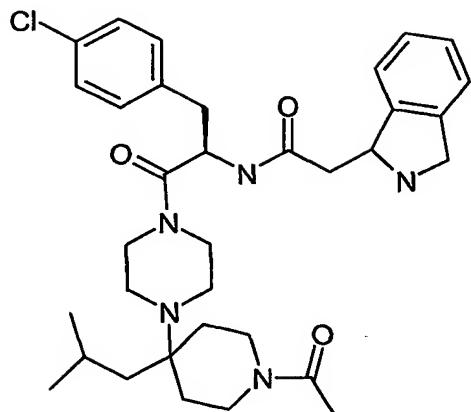
N-{1-(4-Chloro-benzyl)-2-[4-(4-isobutyl-1-methanesulfonyl-piperidin-4-yl)-piperazin-1-yl]-2-oxo-ethyl}-2-(2,3-dihydro-1H-isoindol-1-yl)-acetamide,



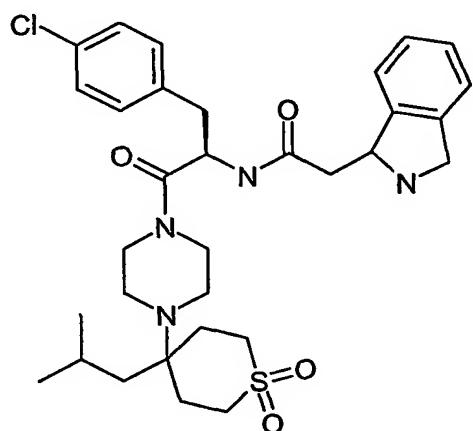
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N-{1-(4-Chloro-benzyl)-2-[4-(1-ethyl-4-isobutyl-piperidin-4-yl)-piperazin-1-yl]-2-oxo-ethyl}-2-(2,3-dihydro-1H-isoindol-1-yl)-acetamide,

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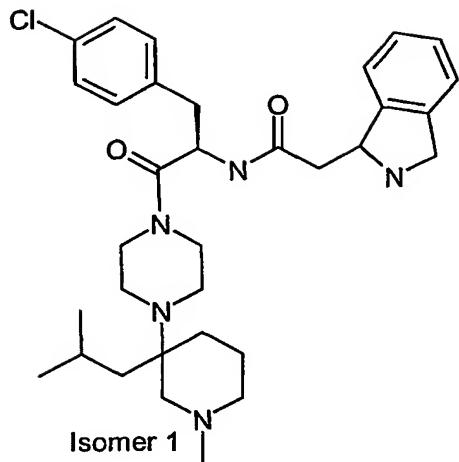
N-[2-[4-(1-Acetyl-4-isobutyl-piperidin-4-yl)-piperazin-1-yl]-1-(4-chloro-benzyl)-2-oxo-ethyl]-2-(2,3-dihydro-1H-isoindol-1-yl)-acetamide,



5

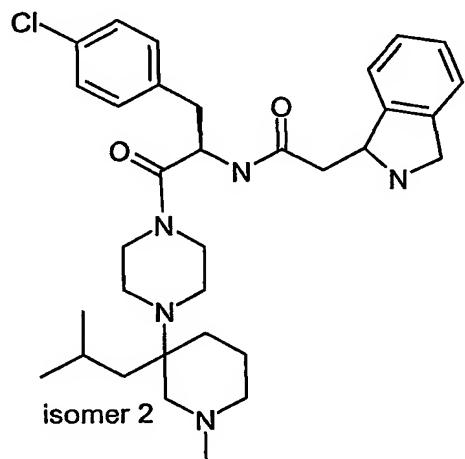
N-{1-(4-Chloro-benzyl)-2-[4-(4-isobutyl-1,1-dioxo-hexahydro-1H-thiopyran-4-yl)-piperazin-1-yl]-2-oxo-ethyl}-2-(2,3-dihydro-1H-isoindol-1-yl)-acetamide,

-190-



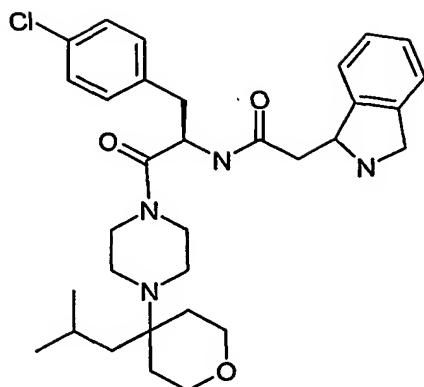
N-{1-(4-Chloro-benzyl)-2-[4-(3-isobutyl-1-methyl-piperidin-3-yl)-piperazin-1-yl]-2-oxo-ethyl}-2-(2,3-dihydro-1H-isoindol-1-yl)-acetamide,

5

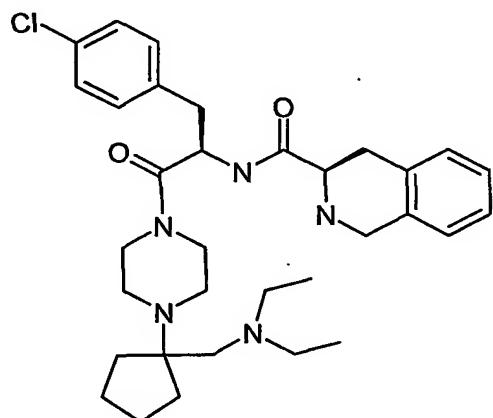


N-{1-(4-Chloro-benzyl)-2-[4-(3-isobutyl-1-methyl-piperidin-3-yl)-piperazin-1-yl]-2-oxo-ethyl}-2-(2,3-dihydro-1H-isoindol-1-yl)-acetamide,

-191-



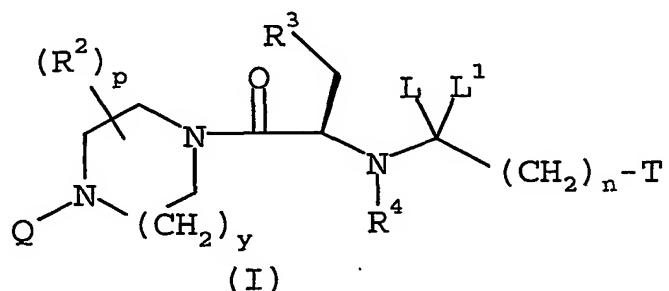
N-{1-(4-Chloro-benzyl)-2-[4-(4-isobutyl-tetrahydro-pyran-4-yl)-piperazin-1-yl]-2-oxo-ethyl}-2-(2,3-dihydro-1H-isoindol-1-yl)-acetamide, and



5

1,2,3,4-Tetrahydro-isoquinoline-3-carboxylic acid {1-(4-chloro-benzyl)-2-[4-(1-diethylaminomethyl-cyclopentyl)-piperazin-1-yl]-2-oxo-ethyl}-amide, and its pharmaceutically acceptable salt, solvate, prodrug and enantiomer thereof.

30. A process for preparing a compound of formula I:



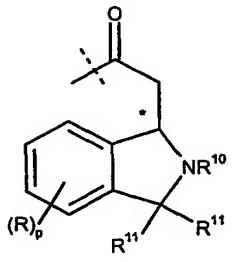
10

or a pharmaceutically acceptable salt or stereoisomer thereof,

-192-

wherein:

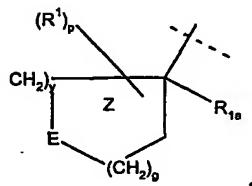
-CLL'-(CH₂)_n-T is:



R¹⁰ is a CBz or Boc protecting group, hydrogen, (C₁-C₈) alkyl, C₃-C₈ alkenyl, C(O)C₁-

5 C₈ alkyl, C₂-C₈ alkynyl, phenyl, aryl, or heteroaryl;

Q is represent the moiety:



L and L¹ are both hydrogen or combine together to form an oxo group;

10

E is: O, S, NR^{1b}, SO, SO₂, CR⁹, or C(R⁹)₂, provided that when E is CR⁹, or C(R⁹)₂, R⁹ may combine with an adjacent R¹ to form a 5, 6, or 7-member saturated or unsaturated carbocycle;

wherein the Z ring has 0, or 1 double bond;

15

R¹ is selected from the group consisting of:

hydrogen,

C₁-C₈ alkyl,

C₂-C₈ alkenyl,

20 C₂-C₄ haloalkyl

(D)C₃-C₇ cycloalkyl,

(D)phenyl,

aryl,

C(O)OC₁-C₈ alkyl,

wherein phenyl, aryl, alkenyl, and cycloalkyl groups are optionally substituted with hydroxy, halo, C₁-C₈ alkyl, C₁-C₄ alkoxy, C₂-C₄ haloalkyl, and (D)C₃-C₇ cycloalkyl provided that the halo, hydroxy are not substituted on a carbon atom adjacent to a heteroatom;

5

R_{1a} is: hydrogen,

C₁-C₈ alkyl,

(D)C₃-C₇ cycloalkyl,

10

(D)phenyl,

(D)aryl,

(D)heteroaryl;

(D)C(O)C₁-C₄ alkyl,

(D)C(O)OC₁-C₄ alkyl,

15

(CH₂)_mN(R⁸)₂,

(CH₂)_mNR⁸C(O)C₁-C₄ alkyl,

(CH₂)_mNR⁸SO₂(C₁-C₄ alkyl),

(CH₂)_mOR⁸,

(CH₂)_mSC₁-C₄ alkyl,

20

(CH₂)_mSO(C₁-C₄ alkyl),

(CH₂)_mSO₂(C₁-C₄ alkyl), or

(CH₂)_mSO₂ N(R⁸)₂;

wherein C₁-C₈ alkyl, C₃-C₇ cycloalkyl, phenyl, aryl and heteroaryl are optionally substituted with one to five substituents independently selected from the group consisting of perfluoroC₁-C₄ alkoxy, halo, hydroxy, C₁-C₈ alkyl, C₁-C₄ alkoxy, and C₁-C₄ haloalkyl; provided that halo and hydroxy groups are not substituted on a carbon atom adjacent to a heteroatom;

25

R^{1b} is: hydrogen,

C₁-C₈ alkyl,

(D)C₃-C₇ cycloalkyl,
SO₂(C₁-C₈ alkyl),
(D)C(O)C₁-C₄ alkyl,
(D)C(O)OC₁-C₄ alkyl,
5 (D)CON(R⁸)₂, or
SO₂(D)phenyl, wherein the phenyl group is optionally substituted with one to five
substituents selected from halo, and C₁-C₈ alkyl;

R² is: hydrogen,
10 C₁-C₈ alkyl,
CONHC₁-C₄ alkyl,
(D)phenyl,
oxo, or
(D)C₃-C₇ cycloalkyl, provided that when R² is oxo, R² is on one of the ring
15 carbon atoms adjacent to the nitrogen atom bearing the Z ring;

R³ is: phenyl, aryl or thienyl;
wherein phenyl; aryl and thienyl are optionally substituted with one to three
substituents independently selected from the group consisting of:
20 cyano, perfluoroC₁-C₄ alkoxy, halo, C₁-C₈ alkyl, (D)C₃-C₇ cycloalkyl, C₁-C₄
alkoxy, C₁-C₄ haloalkyl;

R⁴ is: hydrogen,
C₁-C₈ alkyl,
25 CH₂(CH₂)_mC₁-C₄ alkoxy,
C(O)C₁-C₄ alkyl, or
C(O)OC₁-C₄ alkyl;
R is: hydroxy,
halo,

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C₁-C₈ alkyl,

C₂-C₈ alkenyl,

C₁-C₈ alkoxy,

C₁-C₄ haloalkyl,

5 (D)C₃-C₇ cycloalkyl,

(D)aryl,

(D)heteroaryl;

(D)C(O)C₁-C₄ alkyl,

(D)C(O)OC₁-C₄ alkyl,

10 (D)C(O)heteroaryl,

(D)N(R⁸)₂,

(D)NR⁸C(O)C₁-C₄ alkyl,

(D)NR⁸SO₂(C₁-C₄ alkyl),

(D)OC₁-C₄ alkyl,

15 (D)OC(O)C₁-C₄ alkyl,

(D)heterocyclic,

(D)SC₁-C₄ alkyl, or

(D)SO₂N(R⁸)₂;

wherein C₁-C₈ alkyl, C₁-C₈ alkoxy, C₃-C₇ cycloalkyl, phenyl, aryl, heterocyclic, and heteroaryl are optionally substituted with one to five substituents independently selected from R⁸; and provided that when R is halo or hydroxy it is not substituted on a carbon adjacent to a heteroatom;

each R⁸ is independently:

25 hydrogen,

oxo,

C₁-C₈ alkyl,

(D)C₃-C₇ cycloalkyl,

-196-

phenyl,

aryl or

heteroaryl,

wherein C₁-C₈ alkyl, C₃-C₇ cycloalkyl, phenyl, aryl and heteroaryl are optionally substituted with one to three substituents selected from the group consisting of C₁-C₈ alkyl, halo, and hydroxy; provided that the halo and hydroxy groups are not substituted on a carbon adjacent to a heteroatom;

R⁹ is independently hydrogen, (C₁-C₈) alkyl, C₂-C₈ alkenyl, C(O)C₁-C₈ alkyl, C₂-C₈ alkynyl, phenyl, aryl, or heteroaryl;

10

R¹¹ is independently:

hydrogen, (C₁-C₈) alkyl, (D)phenyl or aryl;

D is: a bond or C₁-C₄ alkyl;

15 g is: 0, 1, or 2;

y is: 1 or 2;

m is: 1-4;

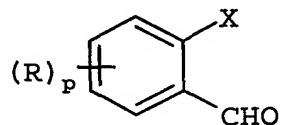
n is: 0-8;

p is: 0-4; and

20 q is: 0-1;

comprising the steps of:

b) reacting a compound having a structural formula 1:

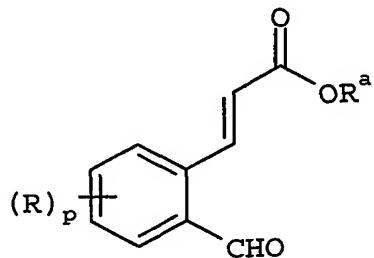


25

(1)

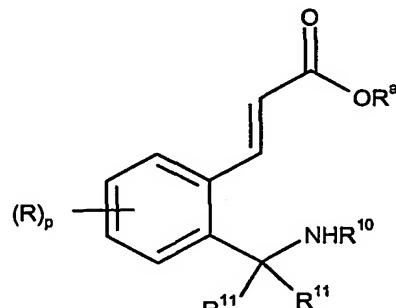
-197-

with $\text{CH}_2\text{CH}=\text{C(O)OR}^{\text{a}}$ wherein R^{a} is hydrogen or C₁-C₈ alkyl and X is halo, in the presence of a catalyst and a base in a suitable organic solvent to give the compound of formula 2:



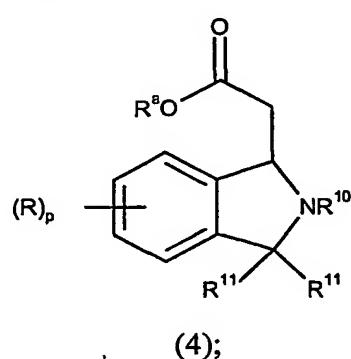
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f) reductively aminating the compound of formula 2 in the presence of amine in an acidic condition to give a compound of formula 3:



10

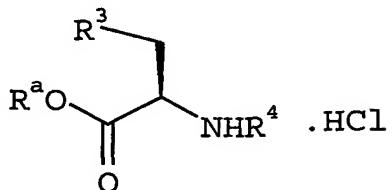
g) cyclizing the compound of formula 3 by Michael addition to give a compound of formula 4 or stereoisomers thereof:



15

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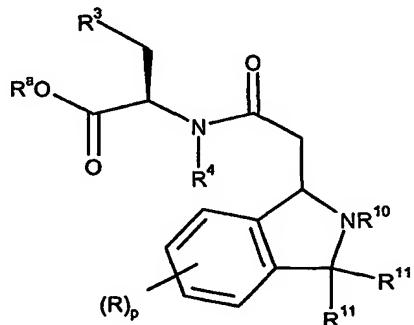
h) coupling the compound of formula 4 or stereoisomers thereof wherein R^a is H, with a compound of formula 5:



(5);

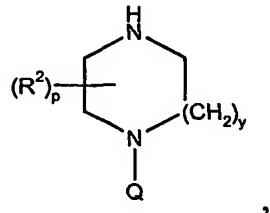
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wherein R^a is C₁-C₈ alkyl, to give a compound of formula 6:



(6); and

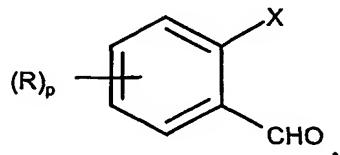
10 i) coupling the compound of formula 6 wherein R^a is H, with a compound having a structural formula:



, to afford the compound of formula 1.

31. The process of Claim 30, wherein:

15



in Step a) is 2-boromobenzaldehyde.

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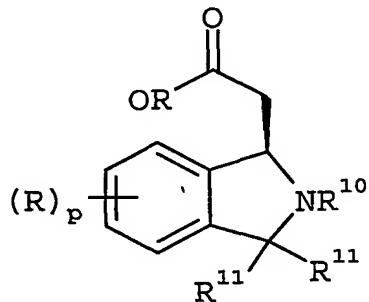
32. The process of Claim 31, wherein $\text{CH}_2\text{CH}=\text{C(O)OR}^{\text{a}}$ in Step (a) is methylacrylate.

33. The process of Claim 32, wherein the catalyst in Step (a) is selected from the group consisting of: $\text{Pd}(\text{Ph}_3\text{P})_2\text{Cl}_2$, $\text{Pd}(\text{Ph}_3\text{P})_4\text{Cl}_2$, $\text{Pd}(\text{Ph}_3\text{P})_4$, $\text{Pd}(\text{Ph}_3\text{P})_2\text{Cl}_2/\text{CuI}$,
5 $\text{Pd}(\text{OAc})_2/\text{Ph}_3\text{P-Bu}_4\text{NBr}$, $\text{Pd}(\text{Ph}_3\text{P})_4\text{Cl}_2/\text{H}_2$ and $\text{Pd}(\text{OAc})_2/\text{P(O-tol)}_3$; and wherein the base in Step (a) is $\text{N}(\text{R})_3$ where R is hydrogen or C₁-C₈ alkyl.

34. The process of Claim 33, wherein the amine in Step (b) is selected from the group consisting of: benzylamine, alpha-methylbenzylamine and BocNH_2 .

35. The process of Claim 34, wherein Step (b) further comprises the step of
10 reducing an intermediate imine compound in the presence of reducing agent selected from the group consisting of: NaCNBH_3 , $\text{Na(OAc)}_3\text{BH}$, NaBH_4/H^+ and a combination of Et_3SiH and TFA in CH_3CN or CH_2Cl_2 .

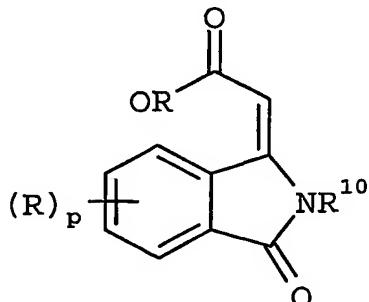
36. The process of Claim 31, wherein the stereoisomer of compound of formula (7) in Step (c) is a compound of formula 7a:



15

(7a).

37. The process of Claim 36, wherein the compound of formula 7a is prepared by asymmetric hydrogenation of a compound having structural formula,



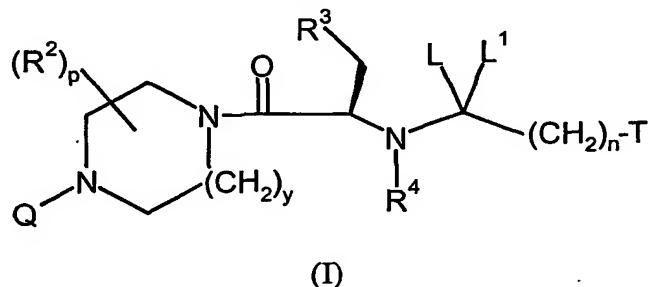
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-200-

38. The process of Claim 31, wherein the Michael addition in Step (c) is carried out under basic workup condition.

39. The process of Claim 31, wherein the Step (e) further comprises deprotecting or protecting of the compound of formula (4) at NR¹⁰.

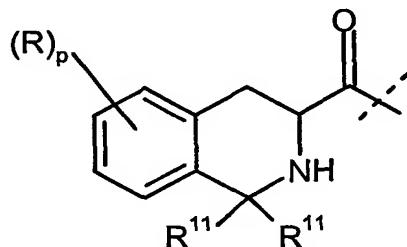
5 40. A process for preparing a compound of formula I:



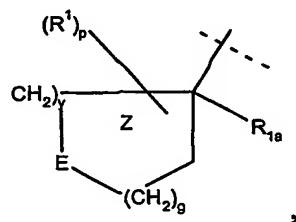
or a pharmaceutically acceptable salt or stereoisomer thereof,

10 wherein:

—LL'(CH₂)_n-T is represented by the group:



and Q represents the moiety:



15

E is: O, S, NR^{1b}, SO, SO₂, CR⁹, or C(R⁹)₂, provided that when E is CR⁹, or C(R⁹)₂, R⁹ may combine with an adjacent R¹ to form a 5, 6, or 7-member saturated or unsaturated carbocycle;

wherein the Z ring has 0, or 1 double bond;

20

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R¹ is selected from the group consisting of:

hydrogen,
C₁-C₈ alkyl,
C₂-C₈ alkenyl,
5 C₂-C₄ haloalkyl
(D)C₃-C₇ cycloalkyl,
(D)phenyl,
aryl,
C(O)OC₁-C₈ alkyl,

10 wherein phenyl, aryl, alkenyl, and cycloalkyl groups are optionally substituted with hydroxy, halo, C₁-C₈ alkyl, C₁-C₄ alkoxy, C₂-C₄ haloalkyl, and (D)C₃-C₇ cycloalkyl provided that the halo, hydroxy are not substituted on a carbon atom adjacent to a heteroatom;

15 R_{1a} is: hydrogen,
C₁-C₈ alkyl,
(D)C₃-C₇ cycloalkyl,
(D)phenyl,
(D)aryl,
20 (D)heteroaryl;
(D)C(O)C₁-C₄ alkyl,
(D)C(O)OC₁-C₄ alkyl,
(CH₂)_mN(R⁸)₂,
(CH₂)_mNR⁸C(O)C₁-C₄ alkyl,
25 (CH₂)_mNR⁸SO₂(C₁-C₄ alkyl),
(CH₂)_mOR⁸,
(CH₂)_mSC₁-C₄ alkyl,
(CH₂)_mSO(C₁-C₄ alkyl),
(CH₂)_mSO₂(C₁-C₄ alkyl), or

$(CH_2)_mSO_2 N(R^8)_2;$

wherein C₁-C₈ alkyl, C₃-C₇ cycloalkyl, phenyl, aryl and heteroaryl are optionally substituted with one to five substituents independently selected from the group consisting of perfluoroC₁-C₄ alkoxy, halo, hydroxy, C₁-C₈ alkyl, C₁-C₄ alkoxy, and C₁-C₄ haloalkyl; provided that halo and hydroxy groups are not substituted on a carbon atom adjacent to a heteroatom;

R^{1b} is: hydrogen,

C₁-C₈ alkyl,

10 (D)C₃-C₇ cycloalkyl,

SO₂(C₁-C₈ alkyl),

(D)C(O)C₁-C₄ alkyl,

(D)C(O)OC₁-C₄ alkyl,

(D)CON(R⁸)₂, or

15 SO₂(D)phenyl, wherein the phenyl group is optionally substituted with one to five substituent selected from halo, and C₁-C₈ alkyl;

R² is: hydrogen,

C₁-C₈ alkyl,

20 CONHC₁-C₄ alkyl,

(D)phenyl,

oxo, or

(D)C₃-C₇ cycloalkyl, provided that when R² is oxo, R² is on one of the ring carbon atoms adjacent to the nitrogen atom bearing the Z ring;

25

R³ is: phenyl, aryl or thienyl;

wherein phenyl, aryl and thienyl are optionally substituted with one to three substituents independently selected from the group consisting of:

cyano, perfluoroC₁-C₄ alkoxy, halo, C₁-C₈ alkyl, (D)C₃-C₇ cycloalkyl, C₁-C₄ alkoxy, C₁-C₄ haloalkyl;

R⁴ is: hydrogen,

5 C₁-C₈ alkyl,

CH₂(CH₂)_mC₁-C₄ alkoxy,

C(O)C₁-C₄ alkyl or

C(O)OC₁-C₄ alkyl;

10 R is: hydroxy,

halo,

C₁-C₈ alkyl,

C₂-C₈ alkenyl,

C₁-C₈ alkoxy,

15 C₁-C₄ haloalkyl,

(D)C₃-C₇ cycloalkyl,

(D)aryl,

(D)heteroaryl;

(D)C(O)C₁-C₄ alkyl,

20 (D)C(O)OC₁-C₄ alkyl,

(D)C(O)heteroaryl,

(D)N(R⁸)₂,

(D)NR⁸C(O)C₁-C₄ alkyl,

(D)NR⁸SO₂(C₁-C₄ alkyl),

25 (D)OC₁-C₄ alkyl,

(D)OC(O)C₁-C₄ alkyl,

(D)heterocyclic,

(D)SC₁-C₄ alkyl, or

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(D)SO₂N(R⁸)₂;

wherein C₁-C₈ alkyl, C₁-C₈ alkoxy, C₃-C₇ cycloalkyl, phenyl, aryl, heterocyclic, and heteroaryl are optionally substituted with one to five substituents independently selected from R⁸; and provided that when R is halo or hydroxy it is not substituted on a carbon adjacent to a heteroatom;

5

each R⁸ is independently:

hydrogen,

oxo,

10 C₁-C₈ alkyl,

(D)C₃-C₇ cycloalkyl,

phenyl,

aryl or

heteroaryl,

15 wherein C₁-C₈ alkyl, C₃-C₇ cycloalkyl, phenyl, aryl and heteroaryl are optionally substituted with one to three substituents selected from the group consisting of C₁-C₈ alkyl, halo, and hydroxy; provided that the halo and hydroxy groups are not substituted on a carbon adjacent to a heteroatom;

20 R⁹ is independently:

hydrogen,

(C₁-C₈) alkyl,

C₂-C₈ alkenyl,

C(O)C₁-C₈ alkyl,

25 C₂-C₈ alkynyl,

phenyl,

aryl, or

heteroaryl;

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R¹⁰ is: hydrogen,

(C₁-C₈) alkyl,

C₃-C₈ alkenyl,

C(O)C₁-C₈ alkyl,

5 C₂-C₈ alkynyl,

phenyl,

aryl, or

heteroaryl;

10 R¹¹ is independently:

hydrogen, (C₁-C₈) alkyl, or (D)phenyl, or aryl;

D is: a bond or C₁-C₄ alkyl;

g is: 0, 1, or 2;

15 y is: 1 or 2;

m is: 1-4;

n is: 0-8;

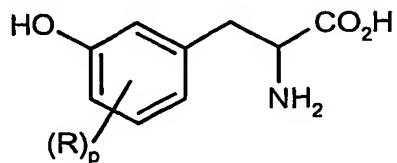
p is: 0-4; and

q is: 0-1;

20

comprising the steps of:

b) esterifying a compound of formula 1 with an alcohol R^aOH

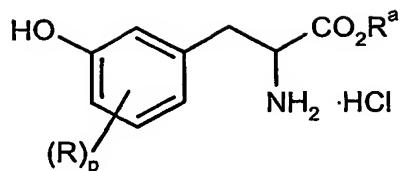


1;

25

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to form a compound of formula 2:

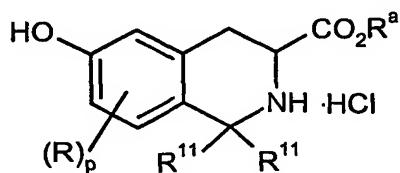


2;

wherein R^a is a group selected from C₁-C₄ alkyl, and (D) phenyl;

5

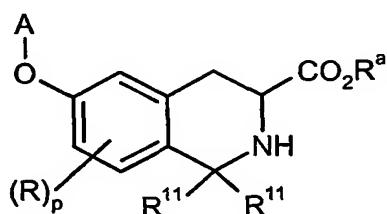
- i) reacting a compound of formula 2 with R¹¹COR¹¹ to form a compound of formula:



3;

10 wherein R¹¹ is independently hydrogen, C₁-C₄ alkyl;

- j) reacting a compound of formula 3 with an activating group to form a compound of formula 4:



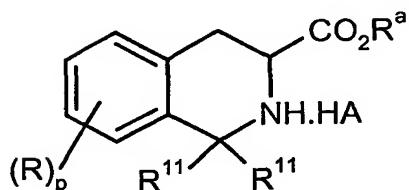
4 ;

wherein A is an activating group;

15

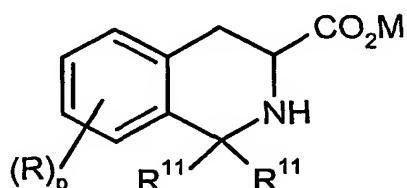
-207-

k) deoxygenating the compound of formula 4 by hydrogenation to afford a compound of formula 5:



5;

l) optionally reacting the compound of formula 5 wherein HA is an acidic, with an inorganic base to form a compound of formula 6:

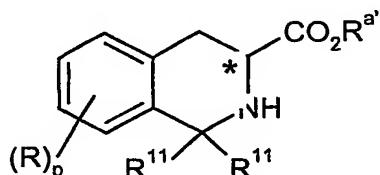


6;

wherein M is a univalent cation;

10

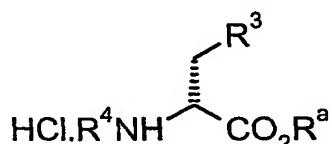
m) resolving the compound of formula 5 or the compound of formula 6 wherein M is hydrogen to afford a chiral compound of formula 7:



7;

15 wherein Ra' is H or R^a;

n) coupling the compound of formula 7 with a compound of formula 8:

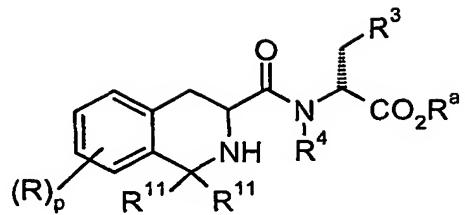


8;

20

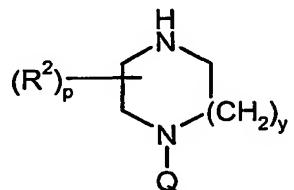
-208-

to afford a compound of formula 9:



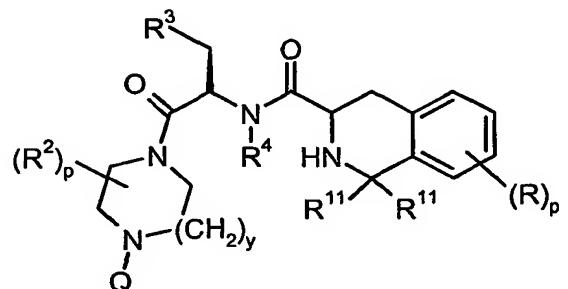
9;

5 o) coupling the compound of formula 9 with a compound of formula 10:



10;

to afford a compound of formula I:



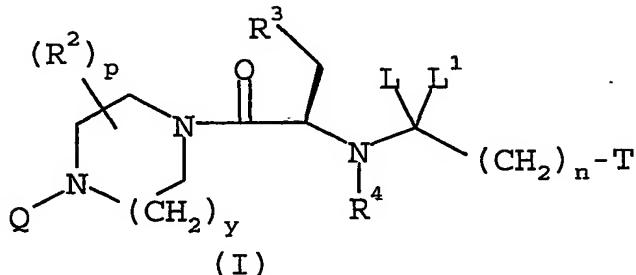
I.

41. The process according to Claim 40 wherein the esterification is performed via an acylhalide intermediate formed by reaction of compound (1) with thionyl chloride, or oxalylchloride.

15 42. The process according to Claim 41 wherein the activating agent is trifluoromethanesulfonic anhydride to form the triflate.

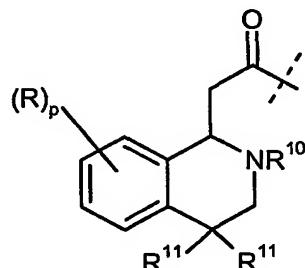
-209-

43. A process for preparing a compound of formula I:



or a pharmaceutically acceptable salt or stereoisomer thereof,

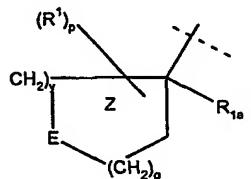
wherein $-LL'(CH_2)_n-T$ is represented by the group:



5

R^{10} is a CBz or Boc protecting group, hydrogen, (C₁-C₈) alkyl, C₃-C₈ alkenyl, C(O)C₁-C₈ alkyl, C₂-C₈ alkynyl, phenyl, aryl, or heteroaryl;

Q represents the moiety:



10

E is: O, S, NR^{1b}, SO, SO₂, CR⁹, or C(R⁹)₂, provided that when E is CR⁹, or C(R⁹)₂, R⁹ may combine with an adjacent R¹ to form a 5, 6, or 7-member saturated or unsaturated carbocycle;

wherein the Z ring has 0, or 1 double bond;

15

R¹ is selected from the group consisting of:

hydrogen,

C₁-C₈ alkyl,

C₂-C₈ alkenyl,

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C₂-C₄ haloalkyl

(D)C₃-C₇ cycloalkyl,

(D)phenyl,

aryl,

5 C(O)OC₁-C₈ alkyl,

wherein phenyl, aryl alkenyl, and cycloalkyl groups are optionally substituted with hydroxy, halo, C₁-C₈ alkyl, C₁-C₄ alkoxy, C₂-C₄ haloalkyl, and (D)C₃-C₇ cycloalkyl provided that the halo, hydroxy are not substituted on a carbon atom adjacent to a heteroatom;

10

R_{1a} is: hydrogen,

C₁-C₈ alkyl,

(D)C₃-C₇ cycloalkyl,

(D)phenyl,

15 (D)aryl,

(D)heteroaryl;

(D)C(O)C₁-C₄ alkyl,

(D)C(O)OC₁-C₄ alkyl,

(CH₂)_mN(R⁸)₂,

20 (CH₂)_mNR⁸C(O)C₁-C₄ alkyl,

(CH₂)_mNR⁸SO₂(C₁-C₄ alkyl),

(CH₂)_mOR⁸,

(CH₂)_mSC₁-C₄ alkyl,

(CH₂)_mSO(C₁-C₄ alkyl),

25 (CH₂)_mSO₂(C₁-C₄ alkyl), or

(CH₂)_mSO₂ N(R⁸)₂;

wherein C₁-C₈ alkyl, C₃-C₇ cycloalkyl, phenyl, aryl and heteroaryl are optionally substituted with one to five substituents independently selected from the group consisting of perfluoroC₁-C₄ alkoxy, halo, hydroxy, C₁-C₈ alkyl, C₁-C₄ alkoxy,

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and C₁-C₄ haloalkyl; provided that halo and hydroxy groups are not substituted on a carbon atom adjacent to a heteroatom;

R^{1b} is: hydrogen,

- 5 C₁-C₈ alkyl,
 (D)C₃-C₇ cycloalkyl,
 SO₂(C₁-C₈ alkyl),
 (D)C(O)C₁-C₄ alkyl,
 (D)C(O)OC₁-C₄ alkyl,
10 (D)CON(R⁸)₂, or
 SO₂(D)phenyl, wherein the phenyl group is optionally substituted with one to 1 to 5 substituent selected from halo, and C₁-C₈ alkyl;

R² is: hydrogen,

- 15 C₁-C₈ alkyl,
 CONHC₁-C₄ alkyl,
 (D)phenyl, oxo, or
 (D)C₃-C₇ cycloalkyl, provided that when R² is oxo, R² is on one of the ring carbon atoms adjacent to the nitrogen atom bearing the Z ring;

- 20 R³ is: phenyl, aryl or thienyl;
 wherein phenyl, aryl and thienyl are optionally substituted with one to three substituents independently selected from the group consisting of:
 cyano, perfluoroC₁-C₄ alkoxy, halo, C₁-C₈ alkyl, (D)C₃-C₇ cycloalkyl, C₁-C₄ alkoxy, C₁-C₄ haloalkyl;

R⁴ is: hydrogen,

- C₁-C₈ alkyl,
CH₂(CH₂)_mC₁-C₄ alkoxy,

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C(O)C₁-C₄ alkyl, or

C(O)OC₁-C₄ alkyl;

R is: hydroxy,

5 halo,

C₁-C₈ alkyl,

C₂-C₈ alkenyl,

C₁-C₈ alkoxy,

C₁-C₄ haloalkyl,

10 (D)C₃-C₇ cycloalkyl,

(D)aryl,

(D)heteroaryl;

(D)C(O)C₁-C₄ alkyl,

(D)C(O)OC₁-C₄ alkyl,

15 (D)C(O)heteroaryl,

(D)N(R⁸)₂,

(D)NR⁸C(O)C₁-C₄ alkyl,

(D)NR⁸SO₂(C₁-C₄ alkyl),

(D)OC₁-C₄ alkyl,

20 (D)OC(O)C₁-C₄ alkyl,

(D)heterocyclic,

(D)SC₁-C₄ alkyl, or

(D)SO₂N(R⁸)₂;

wherein C₁-C₈ alkyl, C₁-C₈ alkoxy, C₃-C₇ cycloalkyl, phenyl, aryl, heterocyclic,
25 and heteroaryl are optionally substituted with one to five substituents
independently selected from R⁸; and provided that when R is halo or hydroxy it is
not substituted on a carbon adjacent to a heteroatom;

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each R⁸ is independently:

- hydrogen,
 - oxo,
 - C₁-C₈ alkyl,
 - 5 (D)C₃-C₇ cycloalkyl,
 - phenyl,
 - aryl or
 - heteroaryl,
- wherein C₁-C₈ alkyl, C₃-C₇ cycloalkyl, phenyl, aryl and heteroaryl are optionally substituted with one to three substituents selected from the group consisting of C₁-C₈ alkyl, halo, and hydroxy; provided that the halo and hydroxy groups are not substituted on a carbon adjacent to a heteroatom;
- 10

R⁹ is independently:

- 15 hydrogen,
- (C₁-C₈) alkyl,
- C₂-C₈ alkenyl,
- C(O)C₁-C₈ alkyl,
- C₂-C₈ alkynyl,
- 20 phenyl,
- aryl, or
- heteroaryl;

R¹¹ is independently:

- 25 hydrogen, (C₁-C₈) alkyl, or (D)phenyl, aryl;

D is: a bond or C₁-C₄ alkyl;

g is: 0, 1, or 2;

y is: 1 or 2;

- 30 m is: 1-4;

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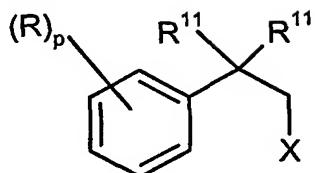
n is: 0-8;

p is: 0-4; and

q is: 0-1;

5 comprising the steps of:

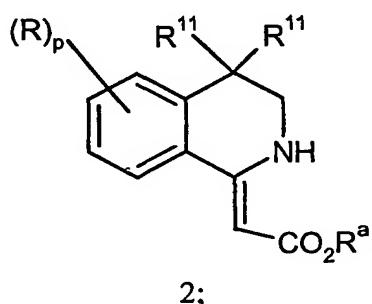
f) reacting a compound formula 1:



1;

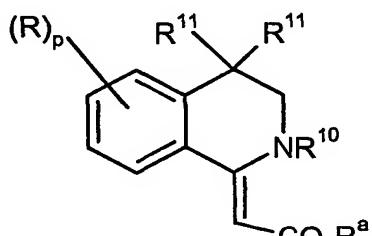
wherein X is halo and R¹¹ is independently, hydrogen or C1-C4 alkyl, with CNCH₂CO₂R^a

10 wherein R^a is C₁-C₈ alkyl, or benzyl to afford a compound of formula 2:



2;

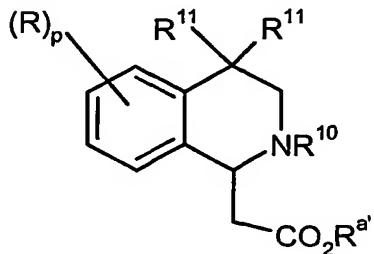
15 g) protecting the compound of formula 2 to form the compound of formula 3:



3;

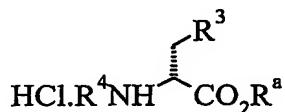
-215-

- h) hydrogenating the compound of formula 3 to afford a compound of formula 4:



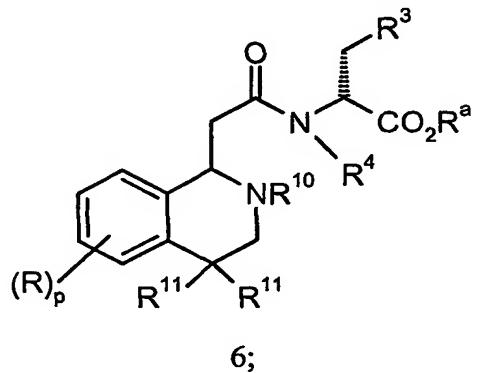
5;

- i) coupling the compound of formula 4 wherein R¹' is hydrogen with a compound of formula 5:



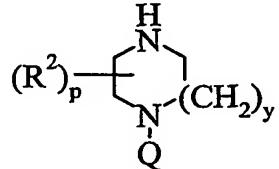
10 5;

to afford a compound of formula 6:



6;

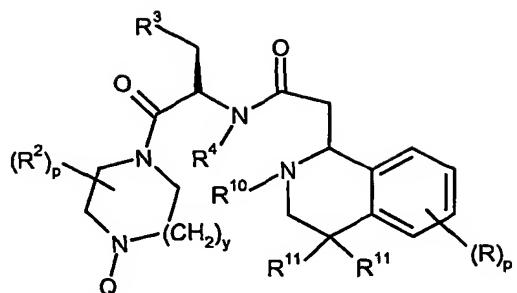
- 15 j) coupling the compound of formula 6 with a compound of formula 7:



7;

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to afford a compound of formula I:



I.

5 44. A method of preventing or treating obesity in a mammal comprising the administration of a therapeutically effective amount of the compound of formula I as recited in Claim 1.

10 45. A method of preventing or treating diabetes mellitus in a mammal comprising the administration of a therapeutically effective amount of the compound of formula I as recited in Claim 1.

46. A method of preventing or treating male or female sexual dysfunction in a mammal comprising the administration of a therapeutically effective amount of the compound of formula I as recited in Claim 1.

15 47. The method of 46, wherein the male or female sexual dysfunction is erectile dysfunction.